ENTOMOLOGY.—*A new subfamily, genus, and species of Lygaeidae (Hemiptera-Heteroptera) from Australia.* CARL J. DRAKE, Smithsonian Institution, and NORMAN T. DAVIS, University of Connecticut.

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The present paper designates a new subfamily of bugs in the very large and heterogeneous family Lygaeidae to hold a remarkable species and genus described as new herein from Australia. The type series of 24 specimens of the new species were all collected by the Australian hemipterist Henry Hacker in Queensland.

Since the hierarchal characters of the undescribed species were found inapplicable for its inclusion in any of the present subfamilial taxa of Lygaeidae, it has been necessary to erect a new genus and new subfamily for its reception. These new categories are being named in honor of the lygaeid specialist Dr. James A. Slater, who is now engaged in classifying and cataloguing this family of insects for the world.

In their comprehensive check-list of the families and subfamilies of Heteroptera, China and Miller (1955) recognize 15 subfamilies in the family Lygaeidae. The fundamental subfamily classification of Lygaeidae was established by Stål (1862, 1865, 1872) and has remained essentially the same except for the addition of five subfamilies by Berg (1879), Reuter (1878) Douglas and Scott (1865), Breddin (1907), and Barber and Bruner (1933). Additional subfamily characters have been developed by Hutchison (1934), Slater and Hurlbutt (1957), Ashlock (1957), and Scudder (1957). Analytical keys to the subfamilies of Lygaeidae for various regions of the world may be found in the publications of Stål (1862, 1865, 1872, 1874), Walker (1872), Saunders (1892), Barber (1917), and Stichel (1925, 1957).

For many helpful suggestions and advice on phylogeny and classification, we wish to express our sincere thanks to the following hemipterists: Dr. W. E. China, British Museum (Natural History), London; Dr. J. Carayon, Muséum National d'Histoire Naturelle, Paris; Dr. J. A. Slater, University of Connecticut, Storrs, Conn.; and Dr. R. I. Sailer, H. G. Barber, and P. D. Ashlock, all of the U. S. Department of Agriculture, Washington, D.C. The illustrations were prepared as follows: Figure 1 was drawn by Arthur Smith, artist, British Museum (Natural History), London; the photograph of figure 2 is by Dr. J. Carayon, Muséum National d'Histoire Naturelle, Paris; the remainder were prepared by the junior author.

MORPHOLOGY

In order to determine accurately the characteristics and systematic position of this insect, the following detailed analysis of its morphology has been made:

Head: The general shape of the head may be characterized as being distinctly broad and short and moderately declivent (Figs. 1, 3). The compound eyes are strongly protruding and widely separated and have rather coarse facets. The eyes are almost contiguous with the thorax. The ocelli are present. The tylus is narrow and strongly produced anteriorly, while the juga are short, flat, and inconspicuous. The bucculae are well developed and open in front, extending back over about a third of the ventral surface of the head. The beak is 4-segmented and straight and reaches to just beyond the procoxae. The antenniferous tubercles are moderately small, and the antennae are short and 4-segmented. The small segments are rather thick and subcylindrical except for the last segment, which is fusiform (Fig. 4).

Thorax: The prothoracic coxal cavities are closed posteriorly (Fig. 6), and the pleural suture is distinguishable only on the prothorax. The meso- and metathoracic sterna are fused, but the intersegmental suture is distinct. There are well-developed scent gland ostioles (SgO) on the metathorax. Internally the metathoracic scent gland consists of a median, unpaired, reservoir (Fig. 10, SgR) into which lateral, branching scent glands open (Sg). The afferent ducts of the scent-gland reservoir pass through the base of the metasternal apophyses to their external

opening in the scent-gland ostioles. The structure of the scent gland is essentially the same as is found in other lygaeids as well as in most other families of Pentatomorpha except the aradids.

The metacoxal articulation is the trochalopodous type. The tarsi are 3-segmented (Figs. 7, 8, 9), the second segment being small and incompletely fused to the third; arolia are present.

Wings: The clavus and corium are distinct, and the membrane appears to have a reticular pattern of venation (Figs. 1, 2). However, there are five distinct longitudinal veins extending through the membrane, and the reticulation has probably developed secondarily. The second and third longitudinal veins are in some cases partly coalesced at the base (Fig. 1), and in others they are entirely separate.

The metathoracic wing venation is greatly reduced (Fig. 11). The terminology used here for the veins follows that of Leston (1953) and of Slater and Hurlbutt (1957). The subcosta is absent; the radius (R) is well developed; the hamus is not distinguishable except possibly as a broad, indistinct veinlike thickening between R and Cu near the base of the wing. The distal branch of the media from R, characteristic of the pentatomorphs, is in this insect only a small stub. The cubitus (Cu) is distinct and is followed by the bifurcate vanal furrow (VF). The intervanal veins are absent, and the vanal veins (V) are present and fused basally. The so-called jugum is absent.

Abdomen: The first abdominal segment is reduced in a manner characteristic of Heteroptera, and thus only the median tergite of that segment can be distinguished (Fig. 12, I). Segments II through VII are distinct, and all the pregenital terga are fused to one another except for tergites II and III, between which there remains an intersegmental membrane. On the venter of the abdomen the second, third, and fourth segments are fused, but the intersegmental sutures are distinct (Fig. 13). The remaining segments are free ventrally. The connexiva are distinctly formed, and the dorsal connexival sutures are modified into convoluted membranes (Fig. 12, CxM) which enable dorso-ventral expansion and contraction of the abdomen. The ventral connexival sutures are very indistinct (Fig. 13). The first abdominal spiracles are apparently absent; spiracles II through VI are dorsal on the connexivum (Fig. 12), and spiracle VII is ventral on the connexivum (Figs. 13, 19). Spiracle VIII of the female is also ventral and is normally concealed under the seventh segment (Fig. 14); the eighth spiracle of the male is absent. Two closely set pairs of trichobothria are found on the venter of segments III and IV; a widely separated pair is found on each side of the fifth and sixth segments near the connexival suture, and a single trichobothrial hair is found on each side of the seventh segment (Fig. 13). Scars of the nymphal scent glands are present between tergites IV and V, and V and VI (Fig. 12, Sg).

Female genitalia and genital segments: The eighth and ninth tergites are compressed ventrad and lie in an almost vertical plane, and the tenth segment is reduced to a small tubular sclerite projecting from beneath the ninth tergum (Fig. 14, X). The seventh segment is very deeply cleft

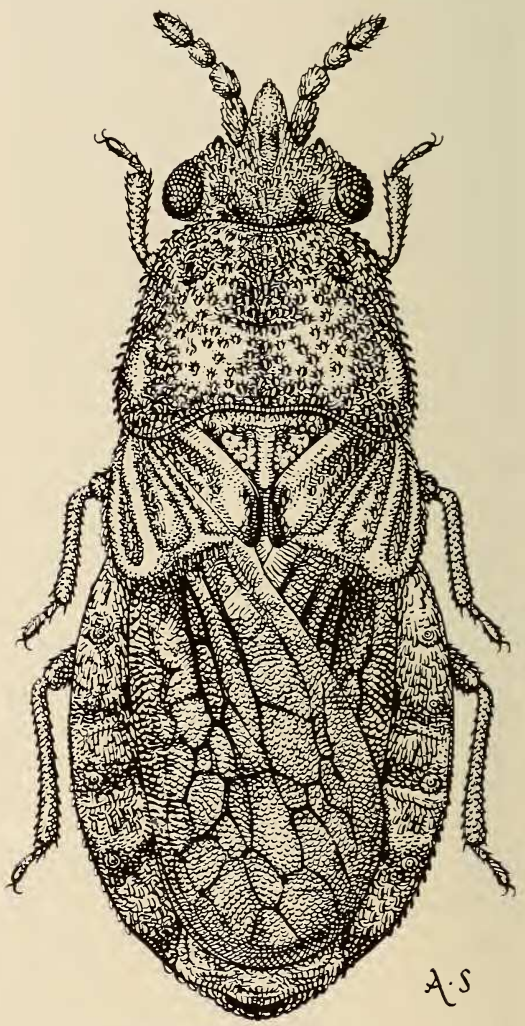


FIG. 1.—*Slaterellus hackeri*, n. gen. and sp.

mid-ventrally and normally overlaps the base of the ovipositor (Fig. 13, VII). When the ovipositor is in use, its anterior end is extended downward and posteriorly into the position shown in Fig. 14. This manner of extension of the ovipositor is especially characteristic of the lygaeids. In this extended position the gonocoxopodites (valvifers) of the eighth segment are seen to be large triangular sclerites (Fig. 14, Gcp 1). The gonocoxopodites of the ninth segment are not shown but are considerably reduced and lie beneath the ventral margins of that segment. The gonapophyses (valvulae) of the eighth segment extend from the anterior apex of the gonocoxopodites and are joined ventrally by a membrane (Fig. 14, Gap 1). The first gonapophyses are also attached to the ventral margins of the ninth paratergites by means of sclerotized rods, the inner rami, extending from their base (not shown). The second gonapophyses are joined for most of their length and are united to the first gonapophyses by the usual tongue-in-groove mechanism found in the heteropteron ovipositors. The third gonapophyses (= styloids of Dupuis, 1955) although usually present in other Hemiptera, can not be distinguished.

Internally the female genital chamber consists of a simple cuticular sac. Posteriorly its lumen extends into the ovipositor, and the common oviduct extends from it anteriorly. Arising from the roof of the genital chamber there is a complex tubular gland, the spermatheca (Fig. 15). At the base of the spermatheca the roof of the genital chamber is differentiated into a pouch-like structure with a groove extending posteriorly from it. This structure possibly functions to direct the vesica of the phallus (see below) into the spermatheca during copulation. The spermatheca consists of a double tube, the *ductus receptaculi* (DR), at the end of which is a distinctive chamber, the *capsula seminis* (Ca S). Various studies of other Heteroptera show that the spermatozoa are retained in the seminal capsule. The distal portion of the duct is sclerotized (PI) and is possibly equivalent to what has been termed the *pars intermedialis* in the pentatomid spermatheca (Dupuis, 1955). The proximal end of this structure is encircled by a ridge which presumably serves for the attachment of muscles extending from it to the lower rim of the seminal capsule. In the lumen of this duct there is a second and much narrower duct which also extends from the genital chamber to the seminal capsule.

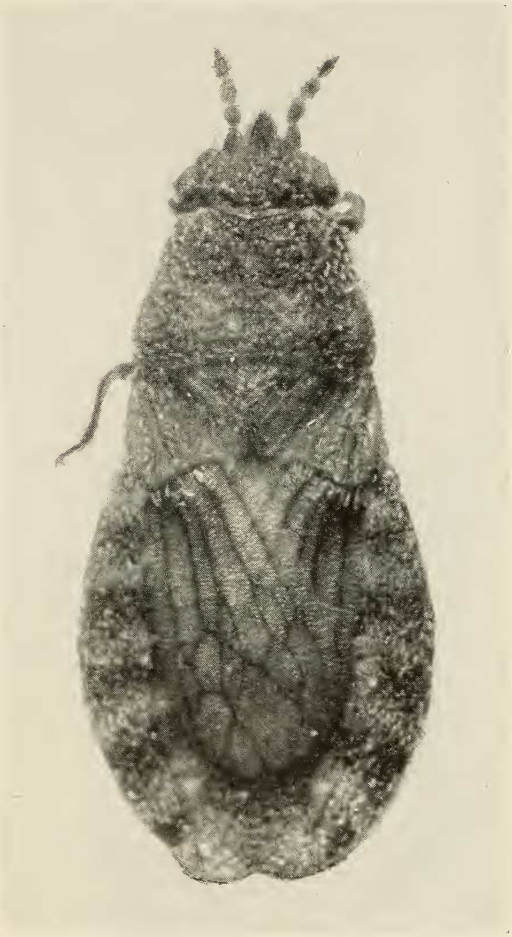


FIG. 2.—*Slaterellus hackeri*, n. gen. and sp.

Male genitalia and genital segments: The eighth segment of the male is reduced considerably, and only the ventral portion of it is sclerotized (Fig. 19, VIII). This segment and the ninth, or *pygophore* (Pg), are normally retracted compactly into the seventh segment. The tenth and eleventh segments are very reduced and are incorporated into the *proctager*, which lies over the top of the pygophore (Fig. 16). The parameres (Fig. 17) are symmetrical and are similar in form to those found in many lygaeids. The phallus is extremely small, and it has been impossible to obtain it in the erect condition and to study many of the details of its structure. At its base is the usual stirrup-shaped *plaque basalis*, or stapes (Fig. 18, BP). The phallus is clearly differentiated into *phallosoma* (Ps) and *endosoma* (Es), and the latter is in all probabil-

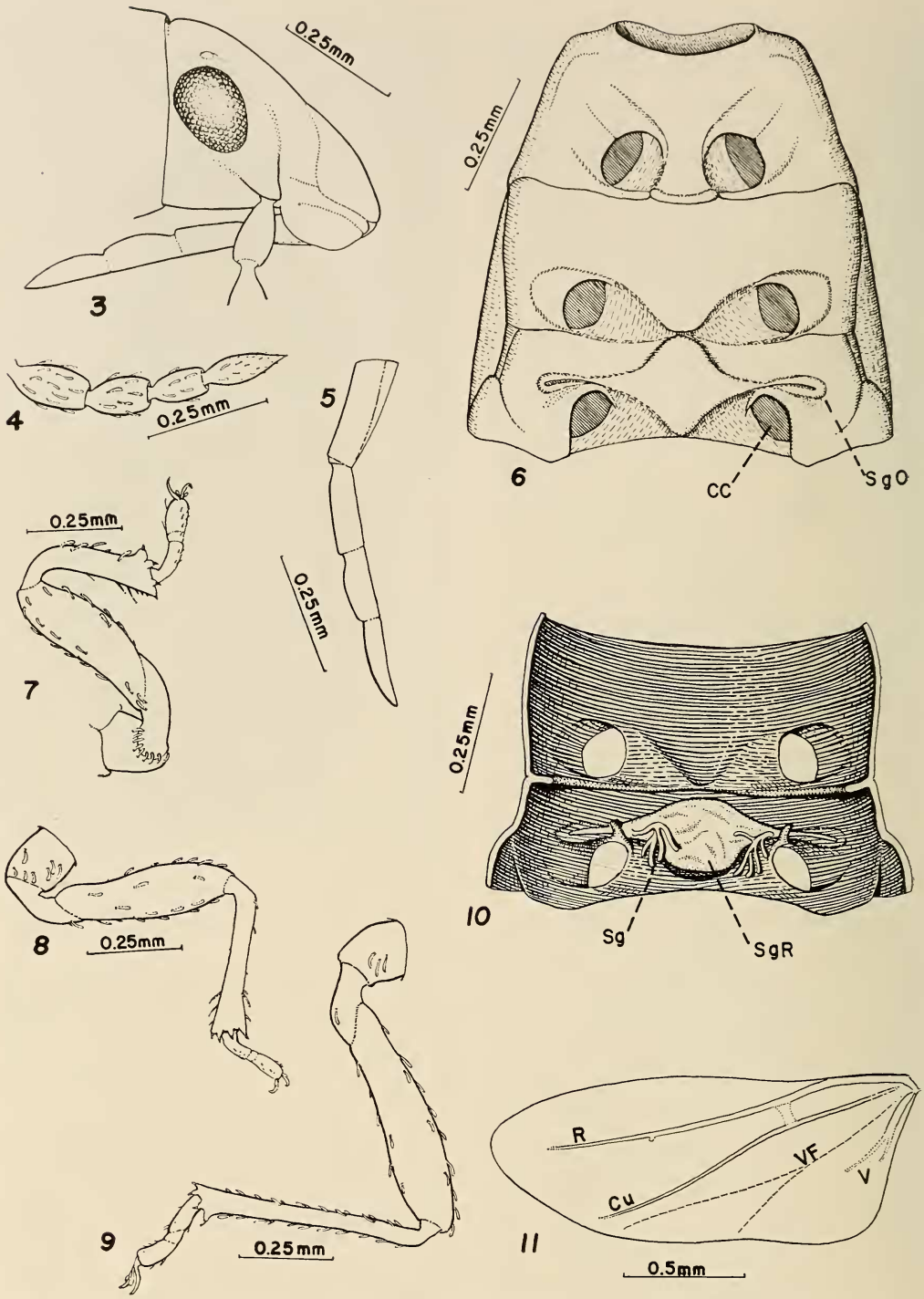
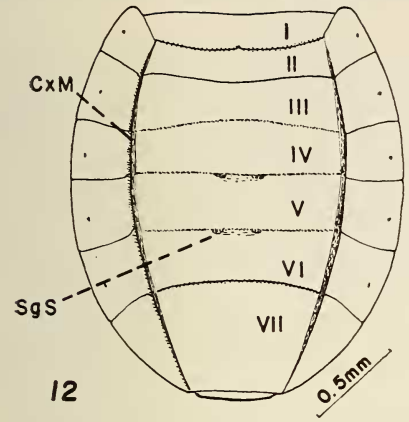
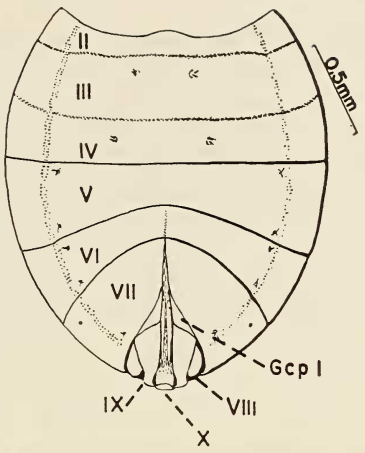
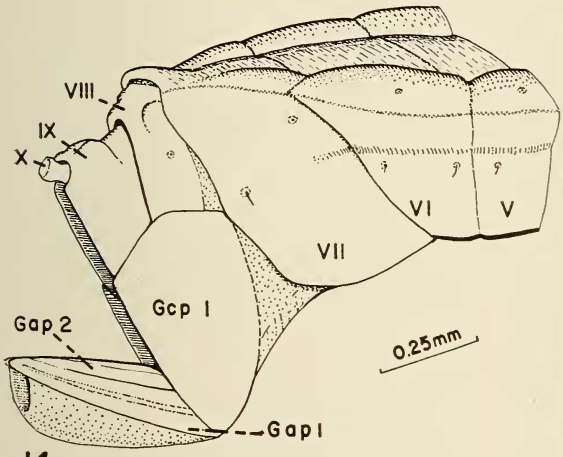
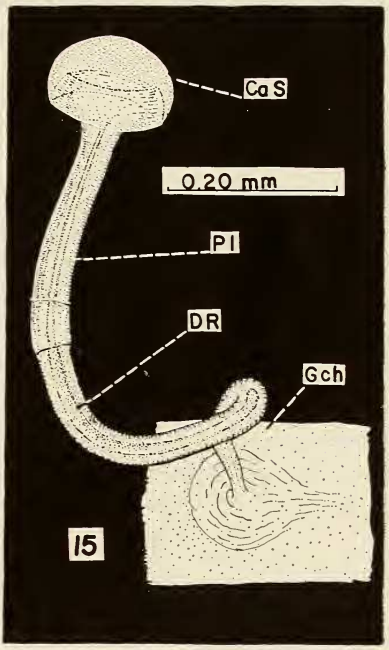


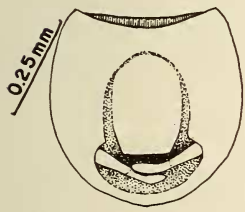
FIG. 3–11.—*Slaterellus hackeri*, n. gen. and sp.: 3, Lateral view of head; 4, antenna; 5, lateral view of labium and labrum; 6, ventral view of thorax with legs removed (CC, coxal cavity; SgO, scent-gland ostiole); 7, left prothoracic leg; 8, right mesothoracic leg; 9, right metathoracic leg; 10, internal view of meso- and metathorax showing scent-gland apparatus (Sg, scent gland; SgR, scent-gland reservoir); 11, metathoracic wing (Cu, cubitus; R, radius; V, vanal veins; VF, vanal fold).

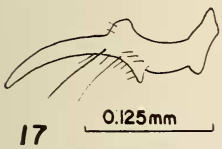


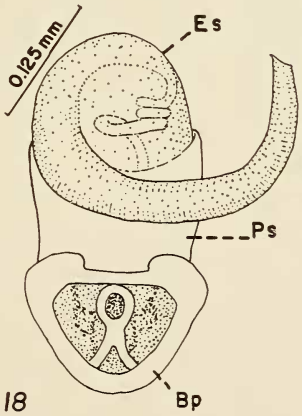


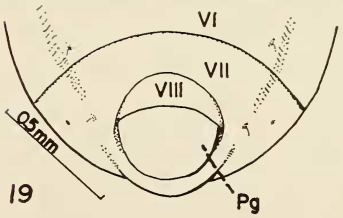












FIGS. 12–19.—*Slaterellus hackeri*, n. gen. and sp.: 12, Dorsal aspect of female abdomen (CxM, connexival membrane; SgS, scent-gland scars); 13, ventral aspect of female abdomen (Gcp 1, first gonocoxopodite); 14, lateral aspect of female abdomen with ovipositor extended (Gap 1, first gonapophysis; Gap 2, second gonapophysis; Gcp 1, first gonocoxopodite); 15, spermatheca (CaS, *capsula seminalis*; Gch, genital chamber; DR, *ductus receptaculi*; PI, *pars intermedialis*); 16, pygophore from above; 17, right paramere from lateral aspect; 18, phallus from dorsal aspect (Bp, basal plate; Ps, phallosoma; Es, endosome); 19, ventral view of terminal segments of male (Pg, pygophore).

ity differentiated into *vesica* and *conjuctiva*. The phallosoma lacks processes.

SYSTEMATIC POSITION

The ventral trichobothria, the type of spermatheca, and the type of phallus are the principle features relating this insect to the group of families of Geocorisae designated as the Pentatomorpha (Leston, Pendergrast, and Southwood, 1954). Of the several families of Pentatomorpha this insect clearly belongs to the Lygaeidae, as is indicated by its possession of the following combination of characteristics: Ocelli present; labium and antennae 4-segmented; tarsi 3-segmented; antennae inserted below a line from the middle of the eyes to the apex of the tylus; five longitudinal veins in the membrane of the hemelytra.

This insect differs from all other lygaeids in having the longitudinal veins of the membrane irregularly connected to one another by cross-veins which form a variable reticular pattern. It also differs from all other lygaeids except the Malcinae and Chauliopinae in having a vestiture of short, scalelike hairs. However, in addition to the characteristic venation of the membrane it is unlike these subfamilies in having closed coxal cavities and in having a different arrangement of abdominal spiracles. It appears to be most closely related to the Blissinae, since it has the same pattern of distribution of abdominal spiracles as the blissines as well as having a head with similar proportions of width to length, similarly shaped pronotum, and similar characteristics of the clavus and claval commissure. The unusually short corium of this insect is also characteristic of some but not all blissines. In addition to the very distinctive vestiture and membrane venation, this insect differs from the Blissinae in lacking swollen fore-femora and in having a punctate corium and clavus.

The lack in this insect of certain additional definitive characters of other subfamilies may be noted. Unlike most Megalonotinae, the suture between segments IV and V is straight and complete, and the paired setae near the eyes are lacking. Unlike the Lygaeinae and Cyminae the hind margin of the pronotum is not convex. The sulcate tylus characteristic of most Geocorisae is lacking and unlike the Megalonotinae, Oxycareninae, Heterogastrinae, and Pachygronthinae the fore-femora are not armed.

Slaterellinae, n. subfam.

Body clothed above and beneath and on appendages with a vestiture of short, scalelike hairs; head with transocular width greater than median length, inserted into pronotum almost to eyes; eyes strongly convex, ocelli present, bucculae moderately short, high, open in front. Forefemora unarmed, not incrassate; tarsi 3-segmented and with arolia; metacoxae trochalopodous; fore-coxal cavities closed. Metathoracic scent gland ostioles distinct; pronotum not constricted into anterior and posterior lobes. Mesothoracic wings with corium short and truncate, forming approximately the basal fourth of the wing, the membrane correspondingly longer; sides of the clavus almost parallel, claval commissure short but more than half as long as the scutellum; membrane with five longitudinal veins that are irregularly connected to one another by cross-veins so as to form a variable and indefinite network. Metathoracic wings with distal branch of media vestigal, hamus reduced or absent, and with intervanal veins and jugal lobe absent. Spiracles dorsal on connexival segments II through VI and ventral to the connexivum on segments VII and VIII, and with VIII absent in the male. Segments II through IV fused but with sutures distinct and straight. Segment V and VI narrowed and segment VII completely divided midventrally in the female. In the male segment VI and VII narrowed midventrally and segment VIII and IX of the female reduced and mostly concealed beneath tergite VII. Pygophore of male concealed beneath tergite VII and with symmetrical parameres. Spermatheca of female terminating in a bulb.

Type genus, *Slaterellus*, n. gen.

Slaterellus, n. gen.

Head depressed, sloping gently forward, transocular width slightly greater than anterior width but less than posterior width of pronotum, and with tylus conical and projecting, jugum short and flat, antenniferous tubercles small, ocelli widely separated, bucculae extending backward forming very low obliquely converging carinae, eyes exserted, large, and widely separated. Antennae thick, very short, scarcely longer than the head. Pronotum depressed, punctate, with lateral margins gradually converging anteriorly, hind margin roundly excavated. Legs with sec-

ond tarsal segment reduced and fused to third. Hemelytra not extending to the apex of the abdomen nor covering the connexival segments; clavus and corium sparcely punctate. Ventral trichobothria on segments III and IV consisting of two patches with a pair of closely set hairs, on segments V and VI a pair of patches on each side with a single hair, and a single patch with one hair on each side of segment VII.

Type species, *Slaterellus hackeri*, n. sp. This monobasic genus is known only from the Australian mainland.

Slaterellus hackeri, n. sp. (Figs. 1, 2)

Small, oblong, fuscous-brown tinged with grayish or testaceous, with blackish patches on head and pronotum, usually also with broad, blackish fuscous; hemelytral membrane grayish with veins fuscous. Antennae (Fig. 4) dark fuscous. Legs (Figs. 7, 8, 9) brownish fuscous with femora largely blackish fuscous. Modified hairy vestiture of body and appendages whitish. Length 2.90 mm (male), 3.34 mm (female); width 1.30 mm (male) and 1.50 mm (female).

Head wider across eyes (0.80 mm) than median longitudinal length (0.55 mm), interocular space slightly longer (0.60 mm) than median length of head (0.55 mm), apex extending slightly beyond tips of first antennal segments; eyes moderately large, strongly excerted, slightly less than half of their width extending laterally beyond front margin of the pronotum; ocelli widely separated, with space between them twice that between an eye and an ocellus. Antennae short, stout, moniliform, 0.54 mm long, subequal in length to width of vertex, segmental measurements: I, 13; II, 10; III, 9; IV, 13; (80 units equal 1 mm.). Labium moderately stout, 4-segmented, extending to base of prosternum. Bucculae very broad, very short, with cariniform bases converging sharply inward. Orifice of metathoracic stink gland plainly visible on metapleura and provided with an upright channel (Fig. 10). Legs short, stout, the anterior pair apparently subfossorial.

Pronotum trapezoidal (Fig. 1), slightly depressed, coarsely but not very closely punctate, broadly roundly excavated behind, wider across base (1.25 mm) than front margin (0.85 mm). Abdomen 1.25 mm long, widest a little behind middle; connexiva wide, very thick, moderately reflexed so as to form a fairly deep trough with abdominal tergites; hemelytra (Fig. 1) not extending to tip of abdomen or covering most of connexival segments; basal coriaceous part very short, extending less than half its length beyond apex of scutellum. Membrane overlapping apically so as to be jointly rounded behind, covering very little of connexival segments and of seventh abdominal tergite (Fig. 1). Scutellum moderately large, triangular, wider across base than median length (38:22), with median carinae and rimmed edges prominently raised. Venation of metathoracic wings as in Fig. 11. Male genitalia as in Figs. 17 and 18. Female genitalia as in Figs. 14 and 15.

Holotype (male) and *allotype* (female), Goodna, Queensland, Australia, December 12, 1926, Drake Collection (U.S. Nat. Mus.). *Paratypes:* 20 specimens same data as holotype; 2 specimens, Manjo District, Queensland, November 1927, and 2 specimens, Forest Hills, Queensland, January 1933; all collected by Hacker.

Paratypes have been deposited in the British Museum (Natural History) London; California Academy of Science, San Francisco; Muséum National d'Historie Natural, Paris; U.S. National Museum, Washington, D.C., and the collections of Drs. J. A. Slater and N. T. Davis, Storrs, Conn., and T. W. Woodward, Brisbane, Australia.

This singular species is named in honor of the eminent entomologist Henry Hacker, whose large collection of insects contains many rare and undescribed species of Australian Hemiptera.

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It is the great destiny of human science, not to ease man's labors or prolong his life, noble as those ends may be, nor to serve the ends of power, but to enable man to walk upright, without fear, in a world which he at length will understand and which is his home. Charles Darwin did not kill the faith of mankind. He wrought mightily, and others with him, for a newer and greater faith—faith in universal order, whose secrets open themselves to men truly free to question, to communicate, and to arrive at agreement as to what they have seen.—Paul B. Sears.